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NATIONAL AIR QUALITY LEVELS AND TRENDS IN TOTAL SUSPENDED PARTICULATES AND SULFUR DIOXIDE DETERMINED BY DATA IN THE NATIONAL AIR SURVEILLANCE NETWORK

Environmental Protection Agency
Research Triangle Park, North Carolina

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air & Water Programs
Office of Air Quality Planning & Standards
Research Triangle Park, North Carolina 27711

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NATIONAL AIR QUALITY LEVELS AND TRENDS IN TOTAL SUSPENDED PARTICULATES AND SULFUR DIOXIDE DETERMINED BY DATA IN THE NATIONAL AIR SURVEILLANCE NETWORK

OFFICE OF AIR QUALITY PLANNING & STANDARDS
Monitoring and Data Analysis Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air & Water Programs
Office of Air Quality Planning & Standards
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APRIL 1973

NOTICE

Subsequent to the printing of this Report, the secondary annual sulfur dioxide air quality standard was eliminated by the Environmental Protection Agency. Although various references to this air quality standard are contained herein, the analysis and findings contained in the report are uneffected.

ABSTRACT

Data collected through the National Air Surveillance Network for the past 12 years have been examined for trends in ambient levels of suspended particulates (TSP) and sulfur dioxide (SO_2). The results of the analysis show that both TSP and SO_2 concentrations at most center city NASN sites have declined significantly over the 12-year period. In general, stations with the highest concentrations in the early 1960's have shown the greatest improvement. The average center-city TSP concentration has decreased by approximately 20 percent while SO_2 concentrations have shown a much greater improvement, decreasing by approximately 50 percent.

These improvements in air quality have primarily resulted from the increased use of cleaner-burning fuels in the residential, commercial, and industrial sectors of most urban areas. Local and State air pollution regulations limiting the use of coal and high-sulfur fuels have resulted in increased use of low-sulfur oil and natural gas as the primary sources of energy. These results are preliminary and will be further developed as State air quality information is included in the trends evaluation.

INTRODUCTION

The purpose of this paper is to (1) report on national trends in total suspended particulates (TSP) and sulfur dioxide (SO_2) by examining data collected through the National Air Surveillance Networks (NASN), and (2) to enumerate the possible reasons for the trends observed. The NASN is a federally-funded air quality monitoring network operated with the assistance and cooperation of state and local agencies. The NASN program was begun in the mid-1950's with 17 urban stations and grew to approximately 150 TSP sampling stations by the mid-1960's located throughout the U.S. The number of stations that comprise the NASN has fluctuated from year to year and reached its zenith in 1971-72 when over 260 TSP and 200 SO_2 stations were maintained. Presently, there are some 258 TSP and 202 SO_2 sampling stations located in the 50 states and Puerto Rico.

Total suspended particulate matter is collected using a high volume air sampler by filtering ambient air through a fiberglass filter over a 24-hour sampling period. Sulfur dioxide is collected by bubbling air through a solution of potassium tetrachloromercurate and analyzed using the West-Gaeke colorimetric method. Both pollutants are collected using a bi-weekly modified random sampling schedule which results in 26 daily samples per station each year. The sampling methods mentioned are both the standard EPA reference methods.

When the NASN was originated, resource limitations dictated placement of only one station in each major urban area. Stations were located primarily in the downtown or center-city area and hence do not necessarily reflect the "worst" air quality to be found throughout heavily-industrialized portions of many urbanized cities. For this reason, there may be differences between

the air quality summarized in this report and the air quality obtained by state monitoring systems used in developing State Implementation Plans.

This paper deals only with trends in annual means; individual 24-hour values are not analyzed with respect to trends or compliance with short-term federal air quality standards. Trends in maximum daily concentrations are currently being examined, and will be presented in a much more comprehensive trends report to be published in the summer of this year.

However, it is felt that this current analysis, although preliminary, has revealed the essence of the nation's trends in TSP and SO_2 air quality.

SUMMARY

Data collected through the NASN for the past 12 years have been examined for trends in ambient levels of TSP and SO_2. For purposes of analysis, the period 1960-1971 has been divided into three intervals consisting of the years 1960-1963, 1964-1967, and 1968-1971, respectively. The analysis, while primarily focusing on air quality concentration levels and trends over the extended 12-year period, is also designed to present limited evaluation of trends during the most recent interval, 1968-1971. Criteria were developed and applied in the selection of sites for analysis for each pollutant.

One-hundred sixteen sites were identified for TSP which had sufficient data over the entire period to develop long-term trends. An additional 61 stations were included in the 4-year analysis for recent, short-term trends.

For SO_2, long-term trends were established based on data from 32 sites over the last two intervals, 1964-1971. As with TSP, a short-term analysis was also performed which permitted the incorporation of an additional 63 sites during the last interval, 1968-1971, in order to identify more recent SO_2 trends.

The results of the analysis show that both TSP and SO_2 concentrations at most center-city NASN sites have declined over the period examined (12 years and 8 years, respectively). In general, stations with the highest concentrations in the early 1960's showed the greatest improvement. The increases in concentration levels were found primarily among the stations with the best initial air quality.

Of the 116 stations used in the analysis of long-term TSP trends, 66, or over half, exhibited statistically significant

downward trends while only eight stations showed an upward trend. The remaining 42 exhibited only small or insignificant changes over the 12-year period. No predominant national trend was observed during the last 4 years although concentration levels are still changing at some locations.

For SO_2, trends in annual averages are even more pronounced. In the 8-year period, 1964-1971, 19 of the 32 selected sites showed a significant downward trend; 12 showed no significant change, and only 1 showed an increase. Considering only the last 4-year period, 1968-1971, the downward trends in SO_2 annual averages are clearly apparent in contrast to TSP. Over the last 4 years, 42 of the 95 stations have shown a significant downward trend; 17 have had no change; 3 have increased; and the remaining 33 have had 4-year averages that were so low ($\leq$ 10 ug/m^3) that testing for trends was unrealistic.

Another indicator of trends in TSP and SO_2 is obtained from examining the percentage of stations showing annual means above the NAAQS. It must be kept in mind that these stations may not represent the area of highest concentration in an Air Quality Control Region, and the results may not be interpreted as demonstrating that the requirements of the Clean Air Act of 1970 have been met.

In the early 1960's, annual geometric means of TSP exceeded the primary annual standard (75 ug/m^3) at approximately 80 percent of the stations reporting. In the late 1960's and early 1970's, the percentage of stations exceeding the annual standard dropped from approximately 80 percent to slightly greater than 60 percent. The change was less noticeable when compared to the secondary annual standard. It should be pointed out that the number of sites in the network doubled during this time period. This did not influence the character of the sample.

Since 1964, the SO_2 picture has changed markedly. In 1964, a third of the sites (6 of 18) exceeded the primary annual standard (80 ug/m^3). By 1971, with 54 stations reporting annual concentrations, only Chicago with 73 ug/m^3 exceeded the secondary annual mean standard (60 ug/m^3), and even there, the trend has been significantly downward from a peak annual mean of 184 ug/m^3 in 1969.

Geographic similarities or differences were defined on the basis of four geographic regions (northeast, northcentral, south, and west). Differences were observed in the levels of both TSP and SO_2. Generally, concentrations of TSP and SO_2 have been greater in the northeast and northcentral regions. This is probably due to the high density of industrial sources in these areas. All regions have shown substantial long-term declines in levels of TSP and SO_2.

Finally, nonurban levels were examined. The results show nonurban or remote sites exhibit no significant trend in TSP over the 12-year period. However, a number of significant upward trends are reported for the last 4-year interval. In fact, this recent increase has merely returned the composite nonurban particulate concentration to a level comparable with the first half of the 12-year period. If only these 4 years had been documented, a different and misleading conclusion would have resulted. This underscores the problems inherent in recognizing trends from records spanning brief time periods.

Data for SO_2 at nonurban stations are too sparse to justify a formal analysis. At the two sites for which we have sufficient valid data, there is either a downward trend or no change.

DISCUSSION OF RESULTS

Figure 1 shows yearly composite averages and ranges of annual means of TSP for 95 urban stations and 18 nonurban stations in comparison to the ambient air quality standards. The trend at the urban stations is downward. The composite mean in 1960 is about 110 ug/m^3; it is 85 in 1971. The 18 nonurban stations evidence no net change. These 95 urban and 18 nonurban stations have at least 1 year of data in the first two intervals and at least 2 years of data in the third interval. The complexity of changing urban habitats, the diversity of topographic and climatological areas being sampled, and the variability in the parameters being measured requires a more definitive analysis than subjectively eyeing the slope of a graph. Therefore, the changes in TSP at individual sites have each been tested for statistical significance and summarized in Table 1. The 12-year picture of statistically-treated trends is downward at over half the stations, 66 of 116, while only eight display a significant upward trend. This long-term decline in total suspended particulate matter is essentially reiterated by consideration of the trends over the last 8 years. Fifty-three of the 119 stations, where this comparison is applicable, evidence a downward trend, while only three display a significant upward trend. The most recent short-term picture is somewhat different, however. A large majority of the trends were not significant but 21 of the locations evidenced upward trends while only 20 locations evidenced a downward trend.

The apparent implications of the short-term trends must be tempered by interpretation in the context of the long-term trends. For example, only one station with long-term upward trends also shows significant upward trends in the last four years. An extreme

case in point is seven stations with statistically-significant increases in the last four years that in fact are minor reversals of much larger significant downward trends over the whole 12-year period.

The essence of Figure 1 and Table 1 is that TSP, as measured at center-city NASN stations, has been stable or declining at the majority of stations over the 12-year period, 1960-1971. Most of the decline appears to have taken place prior to 1968.

Trends at nonurban stations were examined in a similar manner and are summarized in Table 2. Over the 12-year period, the majority of stations evidence no significant change. The downward trends that appear in the analysis of the last 8 years have been effectively cancelled by the upward trends in the last 4 years. This can also be seen in Figure 1 as the dip in the nonurban composite average in 1968-69.

Table 3 presents, year by year, the number of NASN stations exceeding the primary and secondary annual mean standards. Since the total number of valid stations varies from year to year, the percent of stations exceeding each standard is also listed. The increase in <u>number</u> of stations exceeding the standards and the decrease in the <u>percent</u> of stations exceeding the standards reflects the combination of downward trends already discussed and the expanding coverage of the network.

In summary, urban suspended particulate matter concentrations, as measured at 177 center-city NASN stations, are generally lower at the beginning of the 1970's than they were at the beginning of the 1960's, although there has been a minor rebound at about 10 percent of the stations since 1968. Insofar as suspended particulate matter is acknowledged as an indicator of

ambient air quality, the 77 stations, which over the last 4 years, have been consistently above the primary annual mean standard, testify to the continuing need for reform in human activities and continuation and expansion of control programs.

The analysis for SO_2 covers the 8-year period, 1964-1971, because valid data prior to 1964 are too sparse to support generalizations about the national situation. The graph of composite annual arithmetic mean concentrations of sulfur dioxide at 32 urban NASN stations, Figure 2, shows a marked decline over the 1964-1971 period. This is attributed, in some measure, to the institution of regulations in various sections of the country requiring reduced sulfur content in coal and fuel oils. There may also be instances of influential sources converting to cleaner fuels or closing down. Center city power plants are either being replaced by new nonurban plants or are being used for standby.

The arithmetic annual means are used in Figure 2, and later in discussing the status with respect to the national standards. However, since the distribution of air quality measurements is generally considered to be more nearly log-normal than symmetric, geometric means have been used in the statistical analysis for SO_2 trends in an attempt to improve the sensitivity of the tests. The conclusions about overall trends should not be affected.

Figure 3 presents SO_2 air quality trends in selected cities. These cities were chosen since they had reported concentrations in excess of the national standards at the beginning of the reporting period. As documented, all of the selected cities have shown a decline in concentrations. However, they do not all decline at the same rate or exhibit the same pattern of decline.

Table 4 shows over half 19 of the 32 stations with data in both 4 -year intervals trended downward. The expanded NASN network provides 95 stations to examine in the last 4 year interval. Nearly half of the stations (42) show downward trends and another third (33) have annual means so low (less than 10 micrograms per cubic meter) that detection of trends is both statistically difficult and unrealistic.

Data for sulfur dioxide at nonurban stations are too sparse to justify a formal national analysis. Since 1964, the sulfur dioxide picture, with respect to the currently defined annual mean standards, has changed markedly (Table 5). In 1964, a third of the relatively small number of stations (6/18) exceeded the primary annual mean standard (80 ug/m^3). By 1971, three times as many stations reported valid annual means; only one (Chicago, 73 ug/m^3), exceeded the secondary annual mean standard (60 ug/m^3), and even there, the trend has been significantly downward from a peak annual mean of 184 ug/m^3 in 1969.

Since these NASN stations are not source oriented, one should not infer that these results indicate that the NAAQS are being met everywhere in these Air Quality Control Regions.

Geographical differences were examined by first subdividing the United States into four geographic regions as defined by the Bureau of the Census: North Central, Northeast, South, and West. In general, the predominant fuel types are different for each region--coal in the North Central, oil in the Northeast, natural gas in the West.

The statistically significant trends in TSP show that a majority of sites in each region have demonstrated improvements over the long-term periods. The Northeast has been the region

with the highest TSP concentrations during the early 1960's whereas, it now has a comparable level to the North Central. The West, initially higher in concentration than the South, had improved greatly toward the mid-1960's but due to a minor reversal in the early 1970's, is now comparable to the composite level of the South.

For SO_2, the statistically significant trends show that each of the regions has demonstrated improvements over the 8- and 4-year periods. Only one site in the North Central exhibited a significant upward trend in the 8-year period out of a total of 32 in all the regions. Of the 95 stations in the 4-year period, only three exhibited a significant upward trend, two of which are located in the Northeast and one in the South. Thus, the trends in each of the regions follow the national trend of a marked decline in SO_2 at urban stations.

ANALYSIS OF RESULTS

The result of NASN SO_2 analysis has shown a very pronounced downward long-term trend over the 8-year period (1964-1971) at monitoring sites generally located in the cities' central business district. The composite average for the 32 stations dropped over 50 percent. The reasons for this dramatic downward trend are as follows. First, changes in types of fuels used for residential and commercial space heating have changed greatly over the last 10 years. Natural gas, electricity, and low sulfur distillate oils have replaced coal as the major sources of fuel. Second, the quality of fuels burned (i.e., lower sulfur contents) has improved in the last few years. Finally, relocation of older, marginal major point sources, particularly the smaller power generation plants in central cities, coupled with strict local emission regulations has had a significant impact on central city air quality. Increased fuel transportation costs has made it attractive to generate electricity near the fuel source, the so-called minemouth operations in Pennsylvania, for example.

It is felt that the majority of the concentration reduction is due to changes in area source fuels rather than changes or relocation of point sources such as power plants. It is a known meteorological fact that emissions generated at ground level, such as area sources, have a much greater impact on annual average ground level concentrations than the same emissions from an elevated point source. On a ton for ton basis, diffuse ground level emissions are on the average five to six times more important on ground-level receptors than the same emissions from elevated concentrated point sources.

A cursory review of nationwide sulfur dioxide emissions might reveal a conflict since they have increased around 20 percent from 1964 to 1971 (27 million tons to 33 million tons). However, this increase in emissions is a nationwide average while the decrease in SO_2 ambient air concentrations are for center city locations. Thus, the impact of the above-mentioned emission changes have a highly significant impact in and around sampling locations but a very minor insignificant impact on nationwide emissions.

In summary, the combined effect of cleaner area source fuels, movement of large point sources away from central cities, and strict regulations requiring the use of low-sulfur fuels have caused a marked improvement in SO_2 air quality in central cities. Emission reductions from area sources appear to have had the greatest impact on air quality.

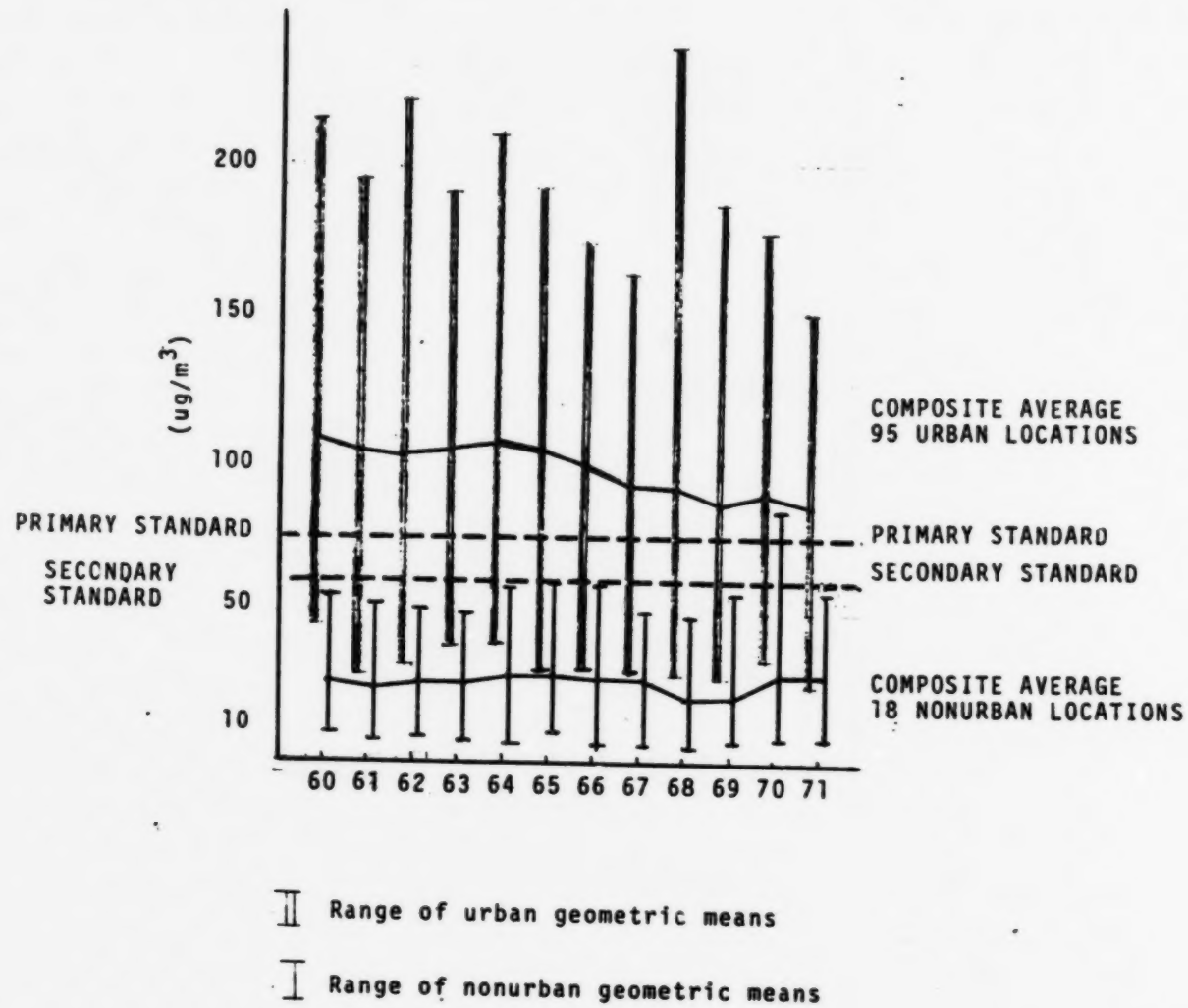
Particulate matter concentrations, like SO_2, have shown a decrease since the early 1960's. The percent reduction has not been as dramatic. A conflict also arises with TSP since, again, nationwide emissions have shown a slight increase (about 10 percent) since 1960. The reasons for this apparent conflict are the same. The use of cleaner fuels for home heating and for office buildings would have significant impact on center city monitors, but a small impact on total nationwide emissions. The increasing controls used on stationary sources such as power plants and industries, coupled with relocation, would also contribute to the decreasing air concentrations.

The percentage of improvement for TSP concentrations has not been as great as SO_2, partly because of the presence of

background or non-controllable "emissions." Background concentrations of SO_2 are essentially zero for urban areas, whereas wind-blown dust and pollen result in particulate concentrations for which emission control plans will have no impact. For this reason, particulate emission reductions are not as effective in terms of percent air quality improvement as are similar reductions in SO_2 emissions.

COMPOSITE LEVELS OF TOTAL SUSPENDED PARTICULATE
AT URBAN AND NONURBAN NASN STATIONS

FIGURE 1



COMPOSITE LEVELS OF SULFUR DIOXIDE
AT 32 NASN STATIONS

FIGURE 2

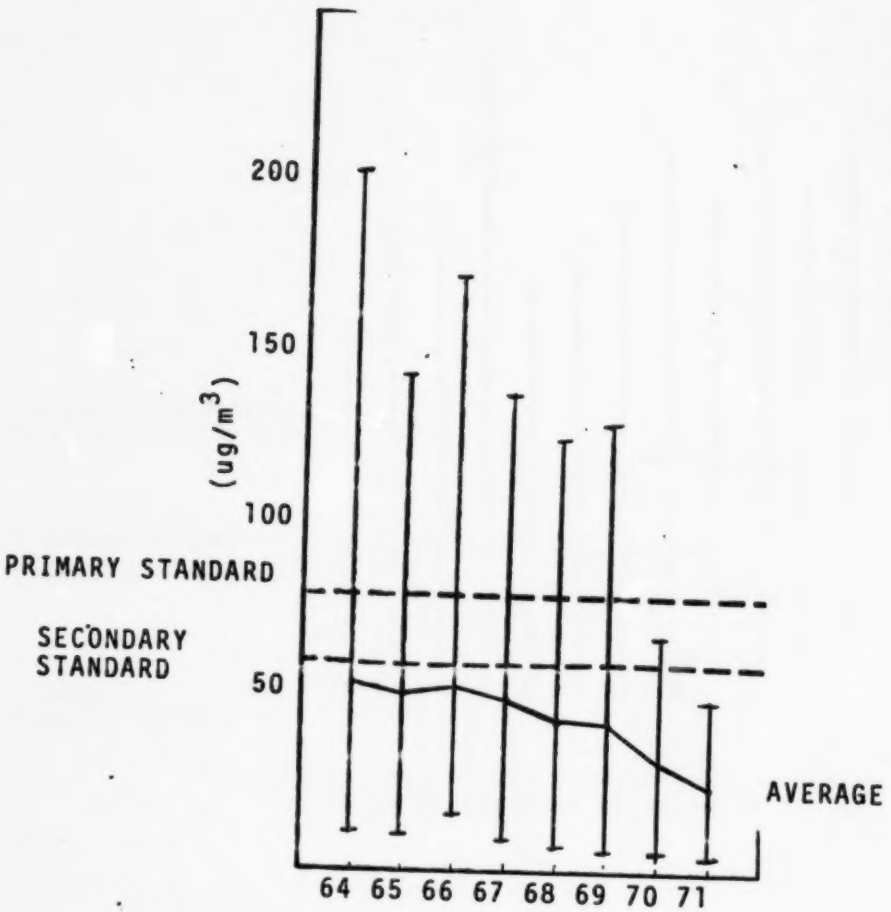


FIGURE 3

TRENDS IN SELECTED SO_2 STATIONS

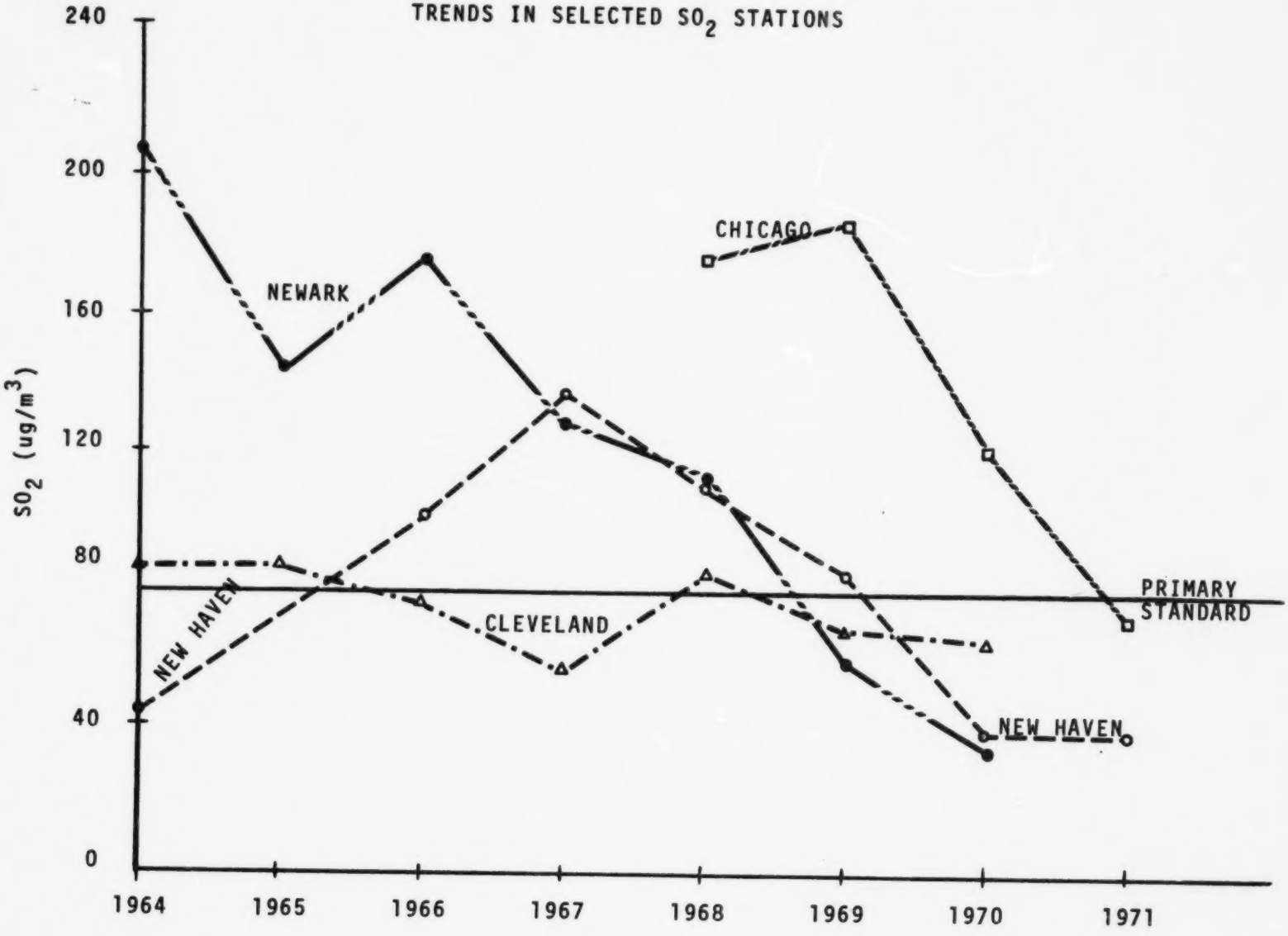


TABLE 1. SUMMARY OF TRENDS IN MEAN SUSPENDED PARTICULATE MATTER CONCENTRATIONS AT URBAN NASN STATIONS, 1960-1971

Type of Trend	Long-Term 12 Years: 1960-1971	Last 8 Years: 1964-1971	Short-Term 4 Years: 1968-1971
Up	8	3	21
No Change	42	63	136
Down	66	53	20
No. of Stations	116	119	177

TABLE 2. TRENDS IN MEAN SUSPENDED PARTICULATE MATTER CONCENTRATIONS AT NONURBAN NASN STATION, 1960-1971

Type of Trend	12 Years 1960-1971	1st 8 Years 1960-1967	Last 8 Years 1964-1971	Last 4 Years 1968-1971
Up	2	4	1	10
No Change	11	11	9	17
Down	5	3	11	-
Low (< 10 ug/m^3)	-	-	-	2
No. of Stations	18	18	21	29

Table 3. NUMBER OF NASN STATIONS EXCEEDING PRIMARY AND SECONDARY ANNUAL MEAN STANDARDS FOR SUSPENDED PARTICULATE MATTER, 1960-1971

	'60	'61	'62	'63	'64	'65	'66	'67	'68	'69	'70	'71
Total Number of Stations	74	72	74	86	80	89	77	90	122	165	170	130
Number > Primary Standard	63	55	61	66	67	72	58	61	76	97	115	78
Number > Secondary Standard	71	63	67	80	74	83	69	80	104	139	153	104
Percent > Primary Standard	85	76	82	77	84	81	68	70	62	59	69	62
Percent > Secondary Standard	96	88	91	93	93	93	90	89	85	84	90	80

Primary standard = 75 ug/m^3
Secondary standard = 60 ug/m^3

TABLE 4. SUMMARY OF TRENDS IN MEAN SULFUR DIOXIDE CONCENTRATIONS AT URBAN NASN STATIONS, 1964-1971

Type of Trend	8 Years: 1964-1971	Last 4 Years: 1968-1971
Up	1	3
No Change	12	17
Down	19	42
Low (< 10 ug/m^3)	-	33
Total No. of Stations	32	95

Table 5. NUMBER OF NASN STATIONS EXCEEDING PRIMARY AND SECONDARY ANNUAL MEAN STANDARDS FOR SULFUR DIOXIDE, 1964-1971

	1964	1965	1966	1967	1968	1969	1970	1971
Total Number of Stations	18	17	15	29	74	88	86	54
Number > Primary Standard	6	6	5	6	10	6	3	0
Number > Secondary Standard	8	7	9	7	18	15	8	1
Percent > Primary Standard	33	35	33	21	14	7	3	0
Percent > Secondary Standard	44	41	60	24	24	17	9	2

Primary standard = 80 ug/m^3

Secondary standard = 60 ug/m^3

NASN TRENDS TABLES

The following tables present observed annual mean levels and trends at individual urban and nonurban NASN stations for TSP, and urban NASN stations for SO_2 during 1960-1971. Annual means are denoted as "0" (zero) in the tables whenever insufficient valid data existed to compute them. The observed trends at these NASN stations do not necessarily represent the temporal change throughout the given city nor its AQCR. As a group, they provide an indication of overall national change in TSP and SO_2 at center city locations and nonurban domains.

The trends are defined over several time sub-intervals and are based on statistically significant changes in geometric mean concentration. The long-term trends are based on change in mean concentrations between four-year sub-intervals: 1960-1963, 1964-1967, 1968-1971. These are denoted in the tables as A, B, and C, respectively.

For TSP, long-term behavior is indicated by the reported trends during 1960-1971 and 1964-1971. Trends over 1960-1967 are included for better definition of the overall temporal pattern. For SO_2, long-term behavior is based on trends during 1964-1971. Recent

short-term behavior is indicated by change during 1968-1971.

Each trend is categorized as DOWN, UP or **, the latter corresponding to no detectable change. For the short-term trend, 1968-1971, the trend may be categorized as LOW indicating that the geometric mean concentration for the interval was $\leq$ 10 ug/m^3 and thus a more specific determination was unrealistic.

All trends are merely representative of past air quality. Without accompanying data on meteorology and emission patterns, these trends should not be extrapolated to predict future concentration levels or continued direction of change.

NASN URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION		A				B				C				TRENDS			
		60	61	62	63	64	65	66	67	68	69	70	71	A : C 60-71	A : B 60-67	B : C 64-71	C 68-71
GADSDEN	ALABAMA 1 1480001 A01	0	0	0	0	85	0	67	0	80	60	71	77			**	**
HUNTSVILLE	ALABAMA 1 1860001 A01	0	0	0	72	0	83	0	62	60	58	61	58	**	**	DOWN	**
MONTGOMERY	ALASKA 1 2460001 A01	0	67	0	76	0	79	0	70	76	75	80	61	**	**	**	**
ANCHORAGE	ARIZONA 2 40003 A01	0	0	0	0	0	0	0	69	60	79	72	59			**	**
MARICOPA COUNTY	ARIZONA 3 440001 A01	54	57	49	56	81	48	47	57	44	37	58	89	**	**	**	UP
PHOENIX	ARIZONA 3 600002 A01	0	195	221	186	163	145	128	154	142	112	0	135	DOWN	DOWN	DOWN	**
TUCSON	ARKANSAS 3 860001 A01	135	121	117	106	128	118	80	89	70	78	96	88	DOWN	DOWN	DOWN	UP
LITTLE ROCK	ARKANSAS 4 1440001 A01	66	70	71	0	69	0	107	79	69	75	64	0	**	UP	DOWN	**
WEST MEMPHIS	CALIFORNIA 4 2740001 A01	0	0	0	0	0	0	88	0	78	73	82	45			DOWN	DOWN
ANAHEIM	CALIFORNIA 5 230001 A01	0	0	0	0	0	0	0	0	0	93	114	116				UP
BURBANK	CALIFORNIA 5 900002 A01	0	0	0	0	135	0	114	0	106	88	123	131			**	UP
GLENDALE	CALIFORNIA 5 2940001 A01	0	110	0	102	0	110	0	75	90	74	87	85	DOWN	**	**	**
LONG BEACH	CALIFORNIA 5 4100001 A01	0	130	0	111	0	123	0	118	115	104	95	87	DOWN	**	DOWN	**
LOS ANGELES	CALIFORNIA 5 4180001 A01	143	162	139	114	111	157	113	91	129	93	125	133	DOWN	DOWN	**	**
OAKLAND	CALIFORNIA 5 5300001 A01	91	0	87	79	79	87	85	87	83	71	64	49	DOWN	**	DOWN	DOWN
ONTARIO	CALIFORNIA 5 5380001 A01	0	0	0	0	0	0	0	0	116	109	116	111				**
PASADENA	CALIFORNIA 5 5760001 A01	122	0	163	0	117	0	119	0	106	0	0	100	DOWN	DOWN	DOWN	**
RIVERSIDE	CALIFORNIA 5 6400001 A01	0	0	0	0	0	0	0	0	116	124	119	0				**
SACHAMENTO	CALIFORNIA 5 6580001 A01	75	0	62	0	68	0	0	0	63	54	57	54	DOWN	**	**	**
SAN BERNARDINO	CALIFORNIA 5 6680001 A01	0	147	0	143	0	0	0	0	92	95	118	104	DOWN			**
SAN DIEGO	CALIFORNIA 5 6800001 A01	76	88	91	76	80	75	63	64	62	73	73	0	DOWN	DOWN	**	**
SAN FRANCISCO	CALIFORNIA 5 6860001 A01	64	58	57	64	56	63	60	66	84	54	50	52	**	**	**	DOWN
SANTA ANA	CALIFORNIA 5 7180001 A01	0	0	0	0	99	0	0	0	0	123	127	140			UP	**
TORRANCE	COLORADO 5 8260001 A01	0	0	0	0	0	0	0	0	0	68	86	0				**
DENVER	6 580001 A01	148	122	114	145	116	135	117	93	107	113	122	118	DOWN	DOWN	**	**

A-3

NASN URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS			
		60	61	62	63	64	65	66	67	68	69	70	71	A : C 60-71	A : B 60-67	B : C 64-71	C 68-71
BRIDGEPORT	CONNECTICUT 7 60001A01	87	0	89	0	0	0	0	0	0	66	64	58	DOWN			**
HARTFORD	CONNECTICUT 7 420001A01	105	72	112	98	106	84	82	76	60	62	62	64	DOWN	**	DOWN	**
NEW HAVEN	CONNECTICUT 7 700001A01	82	85	80	80	103	99	101	83	68	86	93	89	**	UP	DOWN	UP
WATERBURY	CONNECTICUT 7 1240001A01	0	0	0	65	0	105	0	0	0	79	86	88	UP	UP	**	**
NEWARK	DELAWARE 8 140001A01	0	0	0	0	0	83	102	64	64	0	73	69			DOWN	**
WASHINGTON	DIST COLUMBIA 9 20001A01	126	107	88	109	79	94	72	85	86	73	0	73	DOWN	DOWN	**	**
WASHINGTON	DIST COLUMBIA 9 20003A01	0	0	0	0	0	0	0	0	0	0	91	89				**
JACKSONVILLE	FLORIDA 10 1960002A01	0	0	0	0	0	0	0	0	78	76	67	62				**
MIAMI	FLORIDA 10 2700002A01	0	0	0	0	0	0	0	0	0	65	70	68				**
ST PETERSBURG	FLORIDA 10 3980002A01	0	0	0	0	0	0	0	0	0	36	43	43				**
TAMPA	FLORIDA 10 4360002A01	0	0	0	0	0	0	0	0	87	71	87	0				**
ATLANTA	GEORGIA 11 200001A01	102	0	84	96	91	110	89	103	81	78	82	79	DOWN	**	DOWN	**
COLUMBUS	GEORGIA 11 1280001A01	90	0	78	0	0	0	0	0	0	56	56	59	DOWN			**
SAVANNAH	GEORGIA 11 4500001A01	0	77	0	72	0	0	0	0	0	93	81	65	**			DOWN
HONOLULU	HAWAII 12 120001A01	46	40	39	39	42	40	34	36	42	40	35	41	**	DOWN	**	**
BOISE	IDAHO 13 220001A01	120	89	86	70	79	79	89	66	59	95	65	76	DOWN	DOWN	**	UP
CHICAGO	ILLINOIS 14 1220001A01	0	179	115	137	167	133	114	92	112	135	112	115	DOWN	DOWN	**	**
NORTH CHICAGO	ILLINOIS 14 5620002A01	0	0	0	0	0	0	0	0	0	84	83	69				**
PEORIA	ILLINOIS 14 6080001A01	0	0	127	0	126	0	0	0	0	130	131	88	**	**	**	DOWN
ROCK ISLAND	ILLINOIS 14 6700001A01	0	0	0	0	135	0	0	0	0	0	74	91			DOWN	**
SPRINGFIELD	ILLINOIS 14 7280001A01	0	0	110	0	0	91	0	68	66	76	81	83	DOWN	DOWN	**	UP
EAST CHICAGO	INDIANA 15 1180001A01	152	0	0	171	208	192	174	162	144	170	177	150	**	**	DOWN	**
EVANSVILLE	INDIANA 15 1300001A01	129	0	81	0	91	0	0	0	0	89	82	70	DOWN	**	**	**
FORT WAYNE	INDIANA 15 1380001A01	108	0	106	0	109	0	0	0	0	81	90	0	DOWN	**	DOWN	**

NASN URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS			
		60	61	62	63	64	65	66	67	68	69	70	71	A : C 60-71	A : B 60-67	B : C 64-71	C 68-71
GARY	INDIANA 15 1520001A01	190	0	0	0	0	0	0	0	0	119	119	0	DOWN			**
HAMMOND	INDIANA 15 1780001A01	0	121	0	155	0	117	0	110	95	105	116	104	DOWN	**	**	**
INDIANAPOLIS	INDIANA 15 2040001A01	171	149	134	163	153	152	146	127	122	108	106	86	DOWN	**	DOWN	DOWN
NEW ALBANY	INDIANA 15 2980002A01	0	0	0	0	0	0	109	0	0	105	75	0			**	**
SOUTH BEND	INDIANA 15 3880002A01	0	0	0	0	0	0	0	0	0	72	90	0				**
TERRE HAUTE	IOWA 15 4080001A01	0	110	0	126	0	0	0	102	0	92	93	0	DOWN	**	**	**
CEDAR RAPIDS	IOWA 16 640001A01	0	0	0	125	150	123	0	123	91	0	109	0	DOWN	**	DOWN	**
DAVENPORT	IOWA 16 1060001A01	0	95	0	103	0	0	109	0	0	152	148	0	UP	**	UP	**
DES MOINES	KANSAS 16 1180001A01	164	119	116	110	117	127	114	108	90	91	94	86	DOWN	**	DOWN	**
KANSAS CITY	KANSAS 17 1800002A01	0	0	0	0	0	0	0	0	0	131	128	133				**
TOPEKA	KANSAS 17 3560001A01	0	0	0	79	0	74	0	48	61	58	72	102	**	DOWN	UP	UP
WICHITA	KENTUCKY 17 3740001A01	94	0	88	89	88	94	85	77	58	60	83	76	DOWN	**	DOWN	UP
ASHLAND	KENTUCKY 18 80002A01	0	0	0	0	0	0	0	0	122	153	132	143				**
BOWLING GREEN	KENTUCKY 18 320001A01	0	0	0	0	0	0	0	0	0	0	50	51				**
COVINGTON	KENTUCKY 18 800001A01	0	0	0	0	111	0	105	74	83	93	90	90			**	**
LEXINGTON	LOUISIANA 18 2300001A01	0	0	0	0	0	74	0	70	79	0	67	72			**	**
BATON ROUGE	LOUISIANA 19 280001A01	113	0	124	0	80	86	0	0	0	70	65	68	DOWN	DOWN	DOWN	**
NEW ORLEANS	LOUISIANA 19 2020002A01	0	0	0	66	90	90	82	79	84	71	74	70	UP	UP	DOWN	**
SHREVEPORT	MAINE 19 2740001A01	0	0	0	0	0	96	0	0	0	64	76	80			DOWN	**
PORTLAND	MARYLAND 20 960002A01	0	0	0	0	0	0	0	0	75	0	81	71				**
BALTIMORE	MASSACHUSETTS 21 120001A01	127	132	127	125	145	124	133	117	98	110	113	0	DOWN	**	DOWN	**
FALL RIVER	MASSACHUSETTS 22 580002A01	0	0	0	0	0	0	0	0	0	55	64	62				**
SPRINGFIELD	MASSACHUSETTS 22 2160002A01	0	0	0	0	0	0	0	0	0	56	64	0				**
WORCESTER	22 2640001A01	88	88	0	68	0	0	0	0	74	88	111	138	UP			UP

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NASN URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS			
		60	61	62	63	64	65	66	67	68	69	70	71	A : C 60-71	A : B 60-67	B : C 64-71	C 68-71
DETROIT	MICHIGAN																
	23 1180001A01	140	110	106	116	170	152	143	124	134	116	113	92	**	UP	DOWN	DOWN
FLINT	MICHIGAN																
	23 1580001A01	0	0	0	82	0	76	0	66	69	80	77	66	**	**	**	**
GRAND RAPIDS	MICHIGAN																
	23 1820001A01	0	0	94	149	0	110	0	76	90	80	75	75	DOWN	DOWN	**	**
LANSING	MICHIGAN																
	23 2840001A01	70	0	68	0	0	0	0	0	0	69	99	83	UP			**
SAGINAW	MICHIGAN																
	23 4760001A01	93	0	79	0	0	0	0	0	0	66	77	70	DOWN			**
TRENTON	MICHIGAN																
	23 5120001A01	0	0	0	0	0	156	0	0	107	95	99	94			DOWN	**
DULUTH	MINNESOTA																
	24 1040001A01	0	68	0	53	62	0	67	0	64	65	67	55	**	**	**	**
MINNEAPOLIS	MINNESOTA																
	24 2260001A01	93	70	81	70	78	67	80	79	72	70	74	62	**	**	**	**
MOORHEAD	MINNESOTA																
	24 2320001A01	0	0	0	0	84	0	50	0	66	62	71	0			**	**
ST PAUL	MINNESOTA																
	24 3300001A01	98	91	90	103	102	74	96	83	84	69	100	0	**	**	**	**
KANSAS	MISSOURI																
	26 2380002A01	0	0	0	0	0	0	0	0	0	107	103	0				**
ST LOUIS	MISSOURI																
	26 4260001A01	156	132	131	112	138	143	135	112	0	186	0	88	**	**	**	DOWN
LINCOLN	NEBRASKA																
	28 1560002A01	0	0	0	0	0	0	0	0	0	0	63	56				**
OMAHA	NEBRASKA																
	28 1880001A01	97	86	100	96	121	105	120	116	136	103	121	112	UP	UP	**	**
CONCORD	NEW HAMPSHIRE																
	30 120001A01	0	0	0	0	39	32	35	43	33	32	38	38			**	**
BURLINGTON COUNT	NEW JERSEY																
	31 660002A01	0	0	0	0	0	85	91	85	76	64	75	71			DOWN	**
CAMDEN	NEW JERSEY																
	31 720001A01	139	0	145	0	160	0	143	0	123	122	107	0	DOWN	**	DOWN	**
ELIZABETH	NEW JERSEY																
	31 1300002A01	0	0	0	0	0	0	0	0	0	0	83	87				**
GLASSBORO	NEW JERSEY																
	31 1700001A01	0	0	0	0	60	63	59	48	64	63	65	0			**	**
JERSEY CITY	NEW JERSEY																
	31 2320001A01	0	139	0	118	0	133	129	107	101	84	94	100	DOWN	**	DOWN	**
NEWARK	NEW JERSEY																
	31 3480001A01	103	99	101	101	114	113	88	86	83	70	81	0	DOWN	**	DOWN	**
PATERSON	NEW JERSEY																
	31 4140001A01	0	0	0	85	0	99	0	83	78	76	86	0	**	**	**	**
PERTH AMBOY	NEW JERSEY																
	31 4220001A01	0	0	0	0	0	129	0	112	85	73	76	88			DOWN	**
TRENTON	NEW JERSEY																
	31 5400001A01	0	0	0	0	0	0	0	0	62	72	80	0				**

NASN URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS A : C	TRENDS A : B	TRENDS B : C	TRENDS C
		60	61	62	63	64	65	66	67	68	69	70	71	60-71	60-67	64-71	68-71
ALBUQUERQUE	NEW MEXICO 32 40001A01	215	0	147	137	120	77	106	104	87	75	90	96	DOWN	DOWN	DOWN	**
BUFFALO	NEW YORK 33 660001A01	0	0	116	0	0	0	0	0	0	85	99	91	DOWN			**
NEW YORK CITY	NEW YORK 33 4680001A01	151	167	162	190	183	164	124	163	0	106	123	0	DOWN	**	DOWN	**
NIAGARA FALLS	NEW YORK 33 4740001A01	0	0	0	120	0	0	0	0	0	93	109	99	**			**
ROCHESTER	NEW YORK 33 5760001A01	143	107	84	87	0	0	0	0	0	109	116	82	**			DOWN
SYRACUSE	NEW YORK 33 6620001A01	119	123	0	0	0	0	0	0	0	102	94	100	DOWN			**
UTICA	NEW YORK 33 6880001A01	77	76	0	0	0	0	0	0	0	70	85	81	**			**
CHARLOTTE	NORTH CAROLINA 34 700001A01	117	129	0	101	94	103	112	108	109	96	68	0	DOWN	**	DOWN	DOWN
DURHAM	NORTH CAROLINA 34 1160001A01	0	0	0	97	0	0	0	0	133	81	86	0	**			DOWN
GREENSBORO	NORTH CAROLINA 34 1740001A01	0	57	0	64	0	0	0	0	0	98	94	0	UP			**
WINSTON-SALEM	NORTH CAROLINA 34 4460002A01	0	0	0	0	0	0	0	0	0	95	119	115				**
BISMARCK	NORTH DAKOTA 35 100001A01	85	74	74	74	89	0	0	0	70	70	79	73	**	**	**	**
AKRON	OHIO 36 60001A01	141	116	116	113	126	131	118	114	109	93	0	104	DOWN	**	DOWN	**
CANTON	OHIO 36 1000001A01	0	166	0	140	0	0	0	0	0	93	101	88	DOWN			**
CINCINNATI	OHIO 36 1220001A01	136	110	117	116	145	133	138	111	99	104	101	97	DOWN	**	DOWN	**
CINCINNATI	OHIO 36 1220002A01	0	0	0	0	0	0	0	74	78	64	69	0			**	**
CLEVELAND	OHIO 36 1300601A01	160	126	112	144	119	121	104	95	129	112	116	0	DOWN	DOWN	**	**
COLUMBUS	OHIO 36 1460001A01	116	94	98	105	116	109	114	82	91	97	90	71	DOWN	**	DOWN	DOWN
DAYTON	OHIO 36 1660001A01	120	115	102	0	129	0	122	110	103	93	92	89	DOWN	**	DOWN	**
TOLEDO	OHIO 36 6600001A01	0	0	91	99	98	100	83	75	83	71	77	0	DOWN	**	DOWN	**
YOUNGSTOWN	OHIO 36 7760001A01	132	123	140	150	124	133	135	117	112	112	117	108	DOWN	**	**	**
OKLAHOMA CITY	OKLAHOMA 37 2200001A01	0	86	0	0	92	89	93	81	50	64	70	0	DOWN	**	DOWN	UP
TULSA	OKLAHOMA 37 3000001A01	0	0	58	61	63	65	63	48	45	57	55	52	**	**	**	**
PORTLAND	OREGON 38 1460001A01	62	74	97	79	79	113	67	76	64	72	87	0	**	**	**	**

NASN URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS A : C	TRENDS A : B	TRENDS B : C	TRENDS C
		60	61	62	63	64	65	66	67	68	69	70	71	60-71	60-67	64-71	68-71
ALLENTOWN	PENNSYLVANIA 39 120001A01	0	127	0	99	0	0	0	100	83	96	114	90	DOWN	**	**	**
ALTOONA	PENNSYLVANIA 39 140001A01	0	0	0	0	0	116	0	102	83	86	208	102			**	UP
BETHLEHEM	PENNSYLVANIA 39 780002A01	0	0	0	0	0	0	0	0	87	83	98	73				**
ERIE	PENNSYLVANIA 39 3050002A01	0	0	0	0	0	0	0	0	0	65	84	70				**
HARRISBURG	PENNSYLVANIA 39 3480001A01	87	0	0	0	0	0	0	0	61	63	65	84	DOWN			UP
HAZLETON	PENNSYLVANIA 39 3960001A01	0	0	0	0	0	0	0	0	105	97	0	111				**
JOHNSTOWN	PENNSYLVANIA 39 4460001A01	0	148	0	155	0	165	0	0	154	110	132	0	**	**	DOWN	DOWN
PHILADELPHIA	PENNSYLVANIA 39 7140001A01	144	160	151	148	165	170	148	150	112	127	135	100	DOWN	**	DOWN	DOWN
PITTSBURGH	PENNSYLVANIA 39 7260001A01	143	127	153	164	161	137	140	134	161	144	127	0	**	**	**	**
READING	PENNSYLVANIA 39 7620001A01	108	0	122	0	0	114	107	87	126	91	111	0	**	**	**	**
SCRANTON	PENNSYLVANIA 39 8040001A01	0	189	0	158	0	0	0	0	232	195	159	211	**			**
WARMINSTER	PENNSYLVANIA 39 9180001A01	0	0	0	0	0	81	79	90	63	44	51	0			DOWN	DOWN
WILKES BARRE	PENNSYLVANIA 39 9430001A01	105	0	94	0	0	0	0	0	116	90	91	101	**			**
YORK	PENNSYLVANIA 39 9560001A01	0	121	0	130	0	121	0	90	105	102	98	92	DOWN	**	**	**
BAYAMON	PUERTO RICO 40 380002A01	0	0	0	0	0	0	0	0	0	85	104	0				**
CATANO	PUERTO RICO 40 560002A01	0	0	0	0	0	0	0	0	126	160	204	0				UP
GUAYANILLA	PUERTO RICO 40 1080002A01	0	0	0	0	0	0	0	0	0	43	67	58				UP
PONCE	PUERTO RICO 40 1920002A01	0	0	0	0	0	0	0	0	0	81	91	87				**
SAN JUAN	PUERTO RICO 40 2140001A01	0	0	0	0	0	0	0	0	0	77	85	0				**
EAST PROVIDENCE	RHODE ISLAND 41 120001A01	0	0	0	63	0	69	0	56	63	62	54	59	**	**	**	**
PROVIDENCE	RHODE ISLAND 41 300001A01	109	74	93	115	101	117	113	96	86	76	88	84	DOWN	**	DOWN	**
GREENVILLE	SOUTH CAROLINA 42 1180001A01	110	0	70	0	0	0	86	0	92	76	81	63	**	**	**	DOWN
SIOUX FALLS	SOUTH DAKOTA 43 1480001A01	0	57	80	58	79	55	58	0	55	0	0	78	**	**	**	UP
CHATTANOOGA	TENNESSEE 44 360001A01	171	190	146	183	179	143	131	139	135	105	113	0	DOWN	DOWN	DOWN	**

NASN URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS			
		60	61	62	63	64	65	66	67	68	69	70	71	A : C 60-71	A : B 60-67	B : C 64-71	C 68-71
KNOXVILLE	TENNESSEE 44 1740002A01	0	0	0	0	0	0	0	0	0	108	95	83				**
MEMPHIS	TENNESSEE 44 2340001A01	94	93	101	0	109	97	102	88	74	69	78	89	DOWN	**	DOWN	**
NASHVILLE	TEXAS 44 2540001A01	119	107	143	124	108	107	103	99	101	89	90	0	DOWN	DOWN	**	**
DALLAS	TEXAS 45 1310002A01	0	0	0	0	0	0	0	0	71	76	102	83				UP
FORT WORTH	TEXAS 45 1880001A01	72	0	84	0	0	0	0	0	0	81	78	73	**			**
HOUSTON	TEXAS 45 2560001A01	103	89	79	94	96	119	92	105	74	85	87	95	**	**	DOWN	UP
PASADENA	TEXAS 45 4060002A01	0	0	0	0	0	0	0	0	0	77	74	83				**
SAN ANTONIO	UTAH 45 4570001A01	115	80	0	72	91	70	68	76	57	49	54	55	DOWN	DOWN	DOWN	**
OGDEN	UTAH 46 680001A01	0	0	0	0	96	0	61	0	53	78	89	94			**	UP
SALT LAKE CITY	VERMONT 46 920001A01	108	0	140	107	115	99	86	70	65	78	82	0	DOWN	DOWN	DOWN	**
BURLINGTON	VIRGINIA 47 140001A01	52	58	51	0	64	50	69	0	40	42	59	0	DOWN	**	DOWN	UP
DANVILLE	VIRGINIA 48 920001A01	81	0	82	0	86	0	79	0	79	70	89	0	**	**	**	**
HAMPTON	VIRGINIA 48 1440001A01	74	50	0	54	0	70	0	65	60	44	58	53	**	UP	DOWN	**
LYNCHBURG	VIRGINIA 48 1840001A01	0	0	0	0	0	115	0	99	111	89	114	100			**	**
NEWPORT NEWS	VIRGINIA 48 2120001A01	0	0	0	0	0	0	0	0	0	62	67	48				DOWN
NORFOLK	VIRGINIA 48 2140001A01	82	82	94	108	104	108	75	86	95	88	78	75	**	**	**	**
PORTSMOUTH	VIRGINIA 48 2440001A01	0	87	0	81	0	94	0	81	110	78	92	0	**	**	**	DOWN
RICHMOND	VIRGINIA 48 2660002A01	0	0	0	0	0	0	0	0	79	80	83	0				**
ROANOKE	WASHINGTON 48 2700001A01	0	56	0	95	0	93	0	74	77	85	93	87	UP	**	**	**
SEATTLE	WASHINGTON 49 1840001A01	64	76	67	58	60	88	72	64	58	54	62	58	DOWN	**	DOWN	**
SPOKANE	WASHINGTON 49 2040001A01	111	101	0	79	0	0	0	0	0	74	79	82	DOWN			**
TACOMA	WEST VIRGINIA 49 2140001A01	0	0	97	0	63	0	0	0	0	69	62	50	DOWN	DOWN	**	**
CHARLESTON	WEST VIRGINIA 50 280001A01	165	0	167	157	210	144	174	146	239	177	156	130	**	**	**	DOWN
SOUTH CHARLESTON	50 1760001A01	0	0	0	0	0	0	0	0	0	0	117	94				**

NASN URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS			
		60	61	62	63	64	65	66	67	68	69	70	71	A : C 60-71	A : B 60-67	B : C 64-71	C 68-71
EAU CLAIRE	WISCONSIN 51 840002A01	0	0	0	0	0	0	0	0	0	41	56	46				••
KENOSHA	WISCONSIN 51 1540001A01	0	0	0	88	0	89	0	64	64	67	67	68	DOWN	••	••	••
MADISON	WISCONSIN 51 1860001A01	0	77	0	73	0	79	0	55	62	59	68	64	DOWN	••	••	••
MILWAUKEE	WISCONSIN 51 2200001A01	137	0	0	111	133	132	129	125	139	110	91	84	••	••	DOWN	DOWN
RACINE	WISCONSIN 51 2680001A01	145	0	73	0	99	0	0	0	0	50	62	0	DOWN	••	DOWN	••
SUPERIOR	WYOMING 52 120001A01	0	0	0	0	67	0	0	0	75	63	76	0			••	••
CASPER	WYOMING 52 140001A01	0	0	0	0	0	0	0	55	55	61	57	77			••	UP
CHEYENNE		0	29	33	0	40	31	32	31	29	28	34	26	••	••	••	••

NASN NON-URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS A : C	TRENDS A : B	TRENDS B : C	TRENDS C
		60	61	62	63	64	65	66	67	68	69	70	71	60-71	60-67	64-71	68-71
GRAND CANYON NA	ARIZONA																
	3 370001A03	0	15	14	16	19	19	27	17	21	15	21	0	UP	UP	**	**
MONTGOMERY COUNT	ARKANSAS																
	4 1760001A03	36	32	25	35	0	0	38	31	21	24	26	33	DOWN	**	DOWN	UP
HUMBOLDT COUNTY	CALIFORNIA																
	5 3300001A03	0	41	0	33	35	37	35	41	48	38	38	0	**	**	**	**
MESA VERDE NATIO	COLORADO																
	6 1530002A03	0	0	0	0	0	0	0	0	0	14	19	17				**
HARDEE COUNTY	FLORIDA																
	10 1680001A03	0	0	0	0	0	0	0	0	0	24	32	38				UP
BUTTE COUNTY	IDAHO																
	13 340001A03	0	16	0	16	13	12	0	11	9	8	8	11	DOWN	DOWN	DOWN	LOW
MONROE COUNTY	INDIANA																
	15 2600001A03	0	0	0	0	0	0	46	47	39	39	33	40			DOWN	**
PARKE COUNTY	INDIANA																
	15 3260001A03	56	53	52	50	57	48	40	40	33	40	64	59	**	DOWN	**	UP
ACADIA NATIONAL	MAINE																
	20 10001A03	22	25	25	0	24	0	22	25	22	18	25	23	**	**	**	**
SHANNON COUNTY	MISSOURI																
	26 4480002A03	0	0	0	0	0	0	0	0	0	27	26	27				**
GLACIER NATIONAL	MONTANA																
	27 570001A03	10	11	10	0	0	16	12	12	8	11	0	13	**	UP	DOWN	UP
THOMAS COUNTY	NEBRASKA																
	28 2480001A03	24	18	15	20	23	17	23	19	19	16	20	0	**	**	**	**
WHITE PINE COUNT	NEVADA																
	29 560001A03	11	11	15	11	10	10	6	6	8	12	14	0	**	DOWN	UP	UP
COOS COUNTY	NEW HAMPSHIRE																
	30 140001A03	16	16	0	0	20	18	23	21	15	15	20	19	**	UP	DOWN	UP
JEFFERSON COUNTY	NEW YORK																
	33 3340001A03	0	26	25	27	37	33	25	25	21	29	29	22	**	**	**	**
CAPE HATTERAS NA	NORTH CAROLINA																
	34 590001A03	32	30	0	35	58	60	59	50	47	56	84	0	UP	UP	**	UP
CHEROKEE COUNTY	OKLAHOMA																
	37 480001A03	39	37	45	49	42	47	45	39	24	33	45	0	DOWN	**	DOWN	UP
CURRY COUNTY	OREGON																
	38 440001A03	0	0	0	0	0	57	73	46	49	47	47	0			DOWN	**
CLARION COUNTY	PENNSYLVANIA																
	39 1760001A03	45	39	0	28	41	48	37	47	35	29	42	33	**	**	DOWN	**
WASHINGTON COUNT	RHODE ISLAND																
	41 380002A03	0	0	0	0	0	0	0	0	0	28	30	35				**
BLACK HILLS NAT	SOUTH DAKOTA																
	43 110001A03	0	0	17	19	26	19	14	23	8	12	0	14	DOWN	**	DOWN	UP
CUMBERLAND COUNT	TENNESSEE																
	44 660001A03	0	0	0	0	0	0	0	0	0	28	39	0				**
MATAGORDA COUNTY	TEXAS																
	45 3530001A03	0	0	0	0	0	35	30	32	25	27	30	37			**	UP
TOM GREEN COUNTY	TEXAS																
	45 5200001A03	0	0	0	0	0	0	0	0	0	0	51	61				**
ORANGE COUNTY	VERMONT																
	47 360001A03	42	35	39	31	38	36	41	41	28	27	28	29	DOWN	**	DOWN	**

NASN NON-URBAN TOTAL SUSPENDED PARTICULATE MATTER

ANNUAL GEOMETRIC MEANS

LOCATION :		A				B				C				TRENDS			
		60	61	62	63	64	65	66	67	68	69	70	71	A : C 60-71	A : B 60-67	B : C 64-71	C 68-71
SHENANDOAH NATIOVIRGINIA																	
	48 2890001 A03	32	30	32	31	26	32	30	27	27	31	31	28	**	**	**	**
WYTHE COUNTY	VIRGINIA																
	48 3440001 A03	0	0	0	0	0	0	0	0	0	32	32	25				**
KING COUNTY	WASHINGTON																
	49 980002 A03	0	0	0	0	0	0	0	0	0	0	32	28				**
YELLOWSTONE PARKWYOMING																	
	52 860001 A03	0	7	8	7	7	11	8	7	6	7	0	8	**	**	DOWN	LOW

NASN URBAN SULFUR DIOXIDE

LOCATION		ANNUAL ARITHMETIC MEANS								ANNUAL GEOMETRIC MEANS								TRENDS	
		B				C				B				C				B : C	C
		64	65	66	67	68	69	70	71	64	65	66	67	68	69	70	71	64-71	68-71
MONTGOMERY	ALABAMA 1 2460001 A01	0	0	0	0	0	10	7	6	0	0	0	0	0	9	5	5		LOW
PHOENIX	ARIZONA 3 600002 A01	0	0	0	0	10	10	0	10	0	0	0	0	8	9	0	8		LOW
TUCSON	ARIZONA 3 860001 A01	0	0	0	0	0	10	7	0	0	0	0	0	0	9	5	0		LOW
ANAHEIM	CALIFORNIA 5 230001 A01	0	0	0	0	15	13	9	12	0	0	0	0	12	11	6	9		LOW
LONG BEACH	CALIFORNIA 5 4100001 A01	0	0	0	0	56	35	35	0	0	0	0	0	41	30	23	0		**
SAN BERNARDINO	CALIFORNIA 5 6580001 A01	0	0	0	0	10	9	7	0	0	0	0	0	8	9	5	0		LOW
SAN DIEGO	CALIFORNIA 5 6800001 A01	0	0	0	0	12	12	10	0	0	0	0	0	9	10	7	0		LOW
SAN FRANCISCO	CALIFORNIA 5 6860001 A01	0	0	0	0	12	15	9	8	0	0	0	0	8	10	6	7		LOW
SAN JOSE	CALIFORNIA 5 6980002 A01	0	0	0	0	7	9	0	6	0	0	0	0	6	8	0	5		LOW
SANTA ANA	COLORADO 5 7180001 A01	0	0	0	0	0	12	7	0	0	0	0	0	0	11	5	0		LOW
DENVER	COLORADO 6 580001 A01	22	16	0	0	0	17	13	0	20	11	0	0	0	15	8	0	*	DOWN
DENVER	CONNECTICUT 6 580002 A01	0	0	0	0	17	17	11	0	0	0	0	0	14	14	8	0		DOWN
BRIDGEPORT	CONNECTICUT 7 60001 A01	0	0	0	0	79	0	40	0	0	0	0	0	53	0	12	0		DOWN
HARTFORD	CONNECTICUT 7 420001 A01	0	72	62	85	53	56	57	0	0	53	49	61	33	34	30	0	DOWN	**
NEW HAVEN	CONNECTICUT 7 700001 A01	45	0	101	136	109	85	40	40	29	0	70	73	81	33	18	23	DOWN	DOWN
WATERBURY	DELAWARE 7 1240001 A01	0	0	0	0	0	25	17	44	0	0	0	0	0	16	12	32		UP
NEWARK	DELAWARE 8 140001 A01	0	0	0	0	26	0	16	0	0	0	0	0	18	0	8	0		DOWN
WILMINGTON	FLORIDA 8 260003 A01	0	0	0	0	0	0	17	30	0	0	0	0	0	0	9	20		UP
MIAMI	FLORIDA 10 2700002 A01	0	0	0	0	7	10	7	5	0	0	0	0	5	9	5	4		LOW
ST PETERSBURG	FLORIDA 10 3940002 A01	0	0	0	0	0	26	17	16	0	0	0	0	0	18	10	9		DOWN
TAMPA	GEORGIA 10 4360002 A01	0	0	0	0	20	23	17	20	0	0	0	0	14	17	9	11		**
ATLANTA	GEORGIA 11 200001 A01	0	0	0	0	31	26	20	22	0	0	0	0	21	17	11	16		**
COLUMBUS	GEORGIA 11 1280001 A01	0	0	0	0	0	0	8	6	0	0	0	0	0	0	6	5		LOW
SAVANNAH	ILLINOIS 11 4500001 A01	0	0	0	0	0	19	10	7	0	0	0	0	0	14	8	6		LOW
CHICAGO	14 1220002 A01	0	0	0	0	174	184	120	73	0	0	0	0	125	114	48	37		DOWN

NASN URBAN SULFUR DIOXIDE

LOCATION		ANNUAL ARITHMETIC MEANS B				C				ANNUAL GEOMETRIC MEANS B				C				TRENDS B : C	C
		64	65	66	67	68	69	70	71	64	65	66	67	68	69	70	71	64-71	68-71
EAST CHICAGO	INDIANA 15 1180001 A01	0	0	105	117	75	98	57	0	0	0	73	83	56	72	33	0	DOWN	DOWN
EVANSVILLE	INDIANA 15 1300001 A01	0	0	66	47	24	32	25	19	0	0	49	35	18	24	18	14	DOWN	**
HAMMOND	INDIANA 15 1780001 A01	0	0	0	0	0	85	58	32	0	0	0	0	0	53	29	20		DOWN
INDIANAPOLIS	INDIANA 15 2040001 A01	66	47	0	51	39	41	33	11	46	25	0	32	30	26	18	8	DOWN	DOWN
NEW ALBANY	IOWA 15 2980002 A01	0	0	0	0	45	38	0	5	0	0	0	0	29	25	0	4		DOWN
DES MOINES	KANSAS 16 1180001 A01	12	10	0	15	11	17	12	6	8	5	0	10	9	11	7	5	**	LOW
WICHITA	KENTUCKY 17 3740001 A01	0	0	0	0	7	8	6	6	0	0	0	0	6	8	5	5		LOW
COVINGTON	KENTUCKY 18 800001 A01	0	0	35	28	36	31	26	19	0	0	29	21	27	23	18	13	DOWN	DOWN
LEXINGTON	LOUISIANA 18 2300001 A01	0	0	0	0	17	0	12	0	0	0	0	0	11	0	7	0		LOW
NEW ORLEANS	MARYLAND 19 2020002 A01	0	0	0	0	11	9	7	6	0	0	0	0	8	8	6	5		LOW
BALTIMORE	MASSACHUSETTS 21 120001 A01	100	0	0	0	0	58	54	29	65	0	0	0	0	42	33	15	DOWN	DOWN
SPRINGFIELD	MASSACHUSETTS 22 2160002 A01	0	0	0	0	84	63	87	0	0	0	0	0	58	51	51	0		**
WORCESTER	MICHIGAN 22 2660001 A01	0	0	0	0	67	76	31	45	0	0	0	0	48	45	15	24		DOWN
DETROIT	MICHIGAN 23 1180001 A01	0	10	16	42	66	55	38	12	0	7	10	29	54	46	23	9	UP	DOWN
FLINT	MICHIGAN 23 1580001 A01	0	0	0	0	23	25	16	0	0	0	0	0	19	20	12	0		DOWN
GRAND RAPIDS	MICHIGAN 23 1820001 A01	0	0	0	0	22	19	13	0	0	0	0	0	18	16	10	0		DOWN
LANSING	MICHIGAN 23 2860001 A01	0	0	0	0	0	23	22	0	0	0	0	0	0	17	13	0		**
SAGINAW	MICHIGAN 23 4760001 A01	0	0	0	0	0	23	17	12	0	0	0	0	0	19	10	8		DOWN
MINNEAPOLIS	MINNESOTA 24 2260001 A01	27	34	44	47	28	26	38	0	17	18	17	24	16	16	15	0	**	**
ST LOUIS	MISSOURI 26 4280001 A01	87	0	0	84	91	73	0	10	70	0	0	56	78	46	0	7	DOWN	DOWN
ST LOUIS	MISSOURI 26 4280002 A01	0	0	0	0	86	69	40	28	0	0	0	0	66	50	23	19		DOWN
OMAHA	NEBRASKA 28 1880001 A01	0	0	0	20	15	15	0	13	0	0	0	14	10	11	0	9	**	LOW
BURLINGTON COUNT	NEW JERSEY 31 660002 A01	0	0	0	58	52	33	32	10	0	0	0	43	36	25	15	7	DOWN	DOWN
CAMDEN	NEW JERSEY 31 720001 A01	0	0	0	139	126	131	69	0	0	0	0	110	92	108	28	0	DOWN	DOWN

NASN URBAN SULFUR DIOXIDE

LOCATION		ANNUAL ARITHMETIC MEANS B				ANNUAL ARITHMETIC MEANS C				ANNUAL GEOMETRIC MEANS B				ANNUAL GEOMETRIC MEANS C				TRENDS B & C	TRENDS C
		64	65	66	67	68	69	70	71	64	65	66	67	68	69	70	71	64-71	68-71
GLASSBORO	NEW JERSEY 31 1700001 A01	0	0	0	23	25	7	7	0	0	0	0	18	16	7	5	0	DOWN	LOW
JERSEY CITY	NEW JERSEY 31 2320001 A01	0	0	0	0	12	30	75	0	0	0	0	0	7	13	39	0		UP
NEWARK	NEW JERSEY 31 3480001 A01	204	145	174	129	112	61	37	0	158	125	135	86	79	44	16	0	DOWN	DOWN
PATERSON	NEW JERSEY 31 4140001 A01	0	0	0	0	89	57	28	0	0	0	0	0	65	39	12	0		DOWN
ALBUQUERQUE	NEW MEXICO 32 40001 A01	0	0	0	0	6	11	6	0	0	0	0	0	5	8	4	0		LOW
ALBANY	NEW YORK 33 40001 A01	0	0	0	0	0	46	20	47	0	0	0	0	0	36	11	28		DOWN
BUFFALO	NEW YORK 33 660001 A01	0	0	0	0	27	11	0	7	0	0	0	0	18	10	0	6		DOWN
ROCHESTER	NEW YORK 33 5760001 A01	0	0	0	0	44	64	32	22	0	0	0	0	33	39	16	13		DOWN
GREENSBORO	NORTH CAROLINA 34 1740001 A01	0	0	0	0	21	20	13	6	0	0	0	0	14	16	8	5		LOW
AKRON	OHIO 36 60001 A01	0	0	0	0	76	51	51	31	0	0	0	0	59	32	35	15		DOWN
CANTON	OHIO 36 1000001 A01	0	0	0	0	64	34	30	17	0	0	0	0	53	29	19	12		DOWN
CINCINNATI	OHIO 36 1220001 A01	0	0	0	0	29	26	0	17	0	0	0	0	21	20	0	15		**
CINCINNATI	OHIO 36 1220003 A01	0	0	0	0	35	30	25	24	0	0	0	0	25	25	19	14		DOWN
CLEVELAND	OHIO 36 1300001 A01	87	89	78	58	86	67	64	0	68	77	56	45	71	52	47	0	**	**
COLUMBUS	OHIO 36 1460001 A01	0	0	0	0	26	29	22	28	0	0	0	0	22	25	15	19		**
DAYTON	OHIO 36 1660001 A01	31	42	0	22	7	10	25	22	19	31	0	11	5	8	15	13	DOWN	LOW
TOLEDO	OHIO 36 6600001 A01	0	0	0	0	36	33	13	15	0	0	0	0	28	27	9	9		
YOUNGSTOWN	OHIO 36 7760001 A01	63	57	66	56	43	52	30	17	50	41	52	43	35	38	21	9	DOWN	DOWN
OKLAHOMA CITY	OKLAHOMA 37 2200001 A01	0	0	0	11	9	0	7	0	0	0	0	9	7	0	5	0	DOWN	LOW
TULSA	OKLAHOMA 37 3000001 A01	0	0	0	9	7	8	0	5	0	0	0	7	6	7	0	4	**	LOW
ALLENTOWN	PENNSYLVANIA 39 120001 A01	0	0	0	0	49	57	57	0	0	0	0	0	29	42	25	0		**
JOHNSTOWN	PENNSYLVANIA 39 4440001 A01	0	0	0	0	0	39	25	0	0	0	0	0	0	32	13	0		DOWN
PHILADELPHIA	PENNSYLVANIA 39 7140001 A01	0	0	0	0	90	70	84	0	0	0	0	0	66	55	62	0		**
PHILADELPHIA	PENNSYLVANIA 39 7140002 A01	0	0	0	0	0	0	73	54	0	0	0	0	0	0	44	37		**

A.15

NASN URBAN SULFUR DIOXIDE

LOCATION :		ANNUAL ARITHMETIC MEANS								ANNUAL GEOMETRIC MEANS								TRENDS	
		B				C				B				C				B : C	C
		64	65	66	67	68	69	70	71	64	65	66	67	68	69	70	71	64-71	68-71
PITTSBURGH	PENNSYLVANIA 39 7260001 A01	88	89	94	71	76	76	57	50	79	78	83	63	60	62	40	36	DOWN	DOWN
READING	PENNSYLVANIA 39 7620001 A01	0	0	0	0	0	54	30	0	0	0	0	0	0	30	14	0		DOWN
HARRINSTER	PENNSYLVANIA 39 9140001 A01	0	0	0	44	25	28	28	0	0	0	0	33	18	23	14	0	DOWN	**
YORK	PENNSYLVANIA 39 9560002 A01	0	0	0	0	64	44	31	12	0	0	0	0	49	32	17	9		DOWN
BAYAMON	PUERTO RICO 40 3H0002 A01	0	0	0	0	7	9	10	6	0	0	0	0	6	8	7	5		LOW
GUAYANILLA	PUERTO RICO 40 10G0002 A01	0	0	0	0	0	14	15	0	0	0	0	0	0	12	7	0		LOW
PROVIDENCE	RHODE ISLAND 41 300001 A01	112	110	0	39	56	121	67	0	57	70	0	16	29	69	32	0	**	**
CHATTANOOGA	TENNESSEE 44 3H0001 A01	0	0	34	29	0	11	18	0	0	0	17	16	0	9	10	0	DOWN	LOW
MEMPHIS	TENNESSEE 44 2340001 A01	0	0	0	0	10	10	17	7	0	0	0	0	8	9	8	6		LOW
NASHVILLE	TENNESSEE 44 2540001 A01	22	23	29	23	29	20	15	0	14	15	17	14	18	13	11	0	**	**
DALLAS	TEXAS 45 1310002 A01	0	0	0	0	7	9	7	0	0	0	0	0	7	8	6	0		LOW
FORT WORTH	TEXAS 45 1H0001 A01	0	0	0	0	7	11	8	5	0	0	0	0	6	9	6	4		LOW
HOUSTON	TEXAS 45 2560001 A01	0	0	0	0	0	10	10	0	0	0	0	0	0	8	7	0		LOW
PASADENA	TEXAS 45 4060002 A01	0	0	0	0	0	12	0	5	0	0	0	0	0	9	0	4		LOW
SAN ANTONIO	TEXAS 45 4570001 A01	0	0	0	0	7	9	7	0	0	0	0	0	6	8	6	0		LOW
SALT LAKE CITY	UTAH 46 U20001 A01	18	12	20	17	17	28	9	0	12	9	11	11	12	19	7	0	**	DOWN
NORFOLK	VIRGINIA 48 2140001 A01	0	0	0	0	36	36	26	30	0	0	0	0	29	26	17	15		DOWN
RICHMOND	VIRGINIA 48 2660002 A01	0	0	0	0	40	29	24	0	0	0	0	0	30	23	15	0		DOWN
SEATTLE	WASHINGTON 49 1840001 A01	35	35	0	24	26	41	22	24	28	26	0	14	21	30	13	17	**	DOWN
CHARLESTON	WEST VIRGINIA 50 240001 A01	24	17	0	30	29	35	27	7	16	13	0	21	22	25	15	0	**	DOWN
MILWAUKEE	WISCONSIN 51 2200001 A01	20	15	31	41	38	16	16	0	18	12	24	34	28	14	12	0	**	DOWN
CASPER	WYOMING 52 120001 A01	0	0	0	25	9	14	9	0	0	0	0	16	8	10	6	0	DOWN	LOW